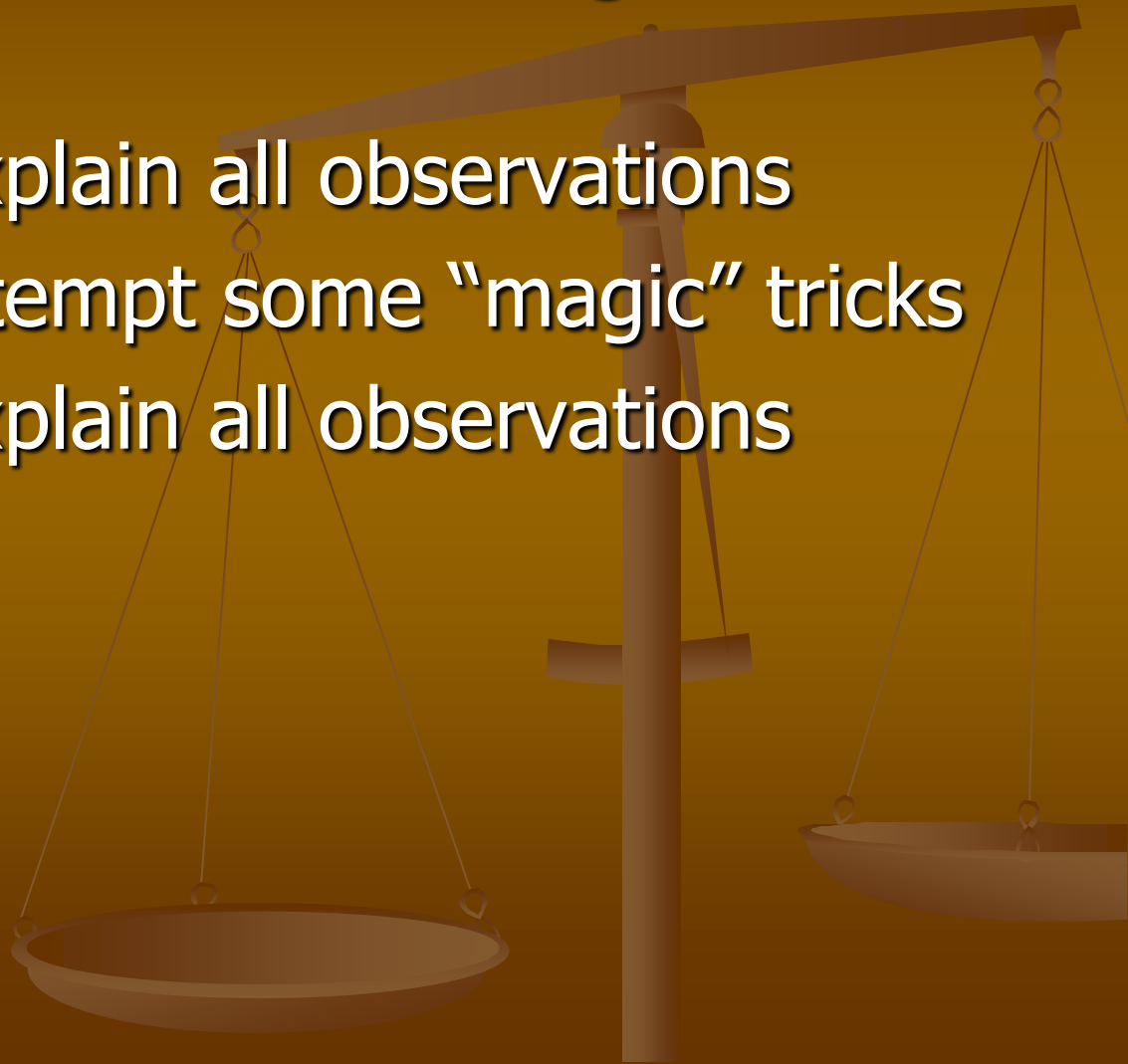


Project

- Observe the motion of a bowling ball on a cart
- Describe and explain all observations
- Observe and attempt some “magic” tricks
- Describe and explain all observations



Lesson #23

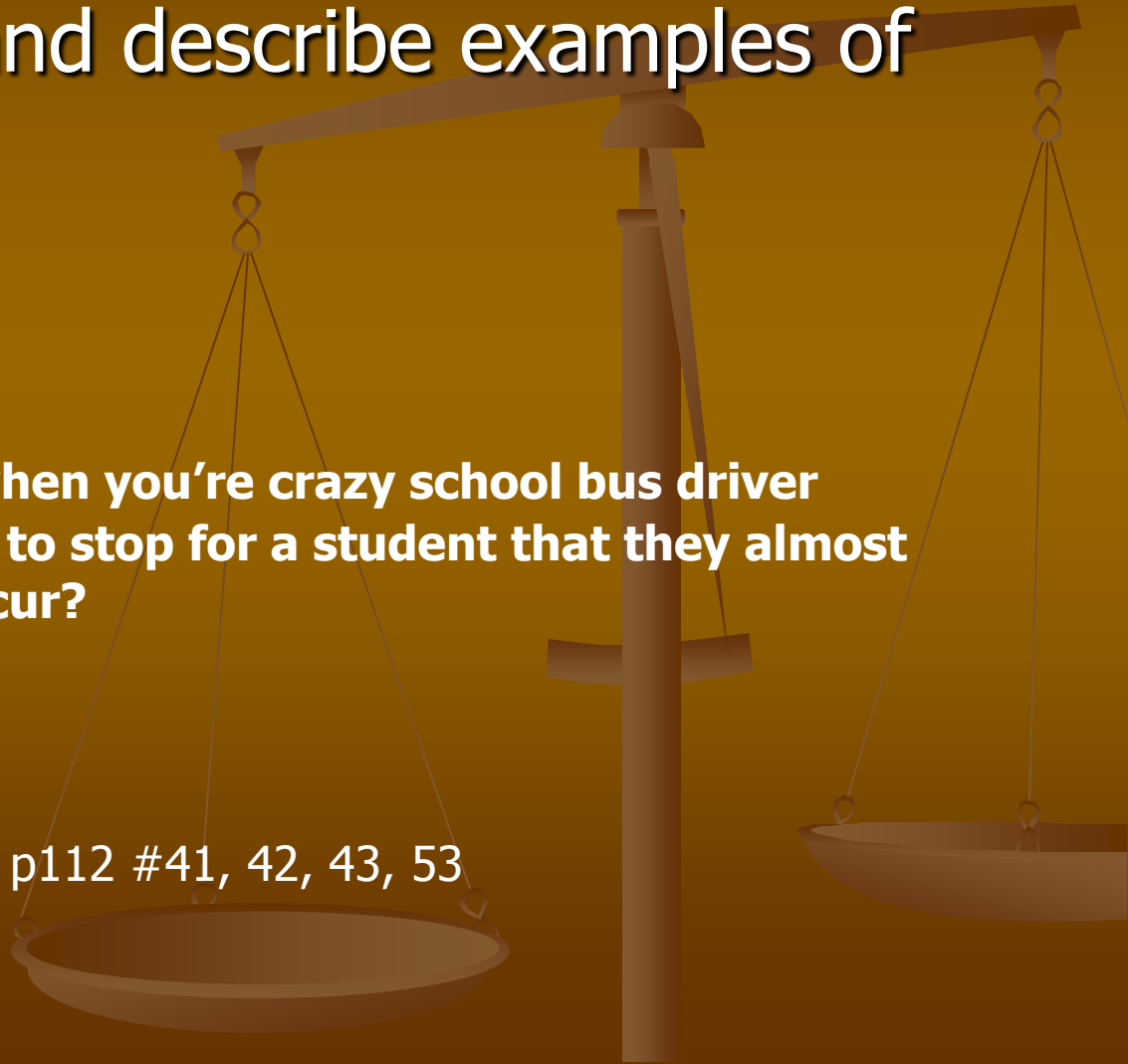
Topic: Intro to Newton and Inertia

Objectives: (After this class I will be able to)

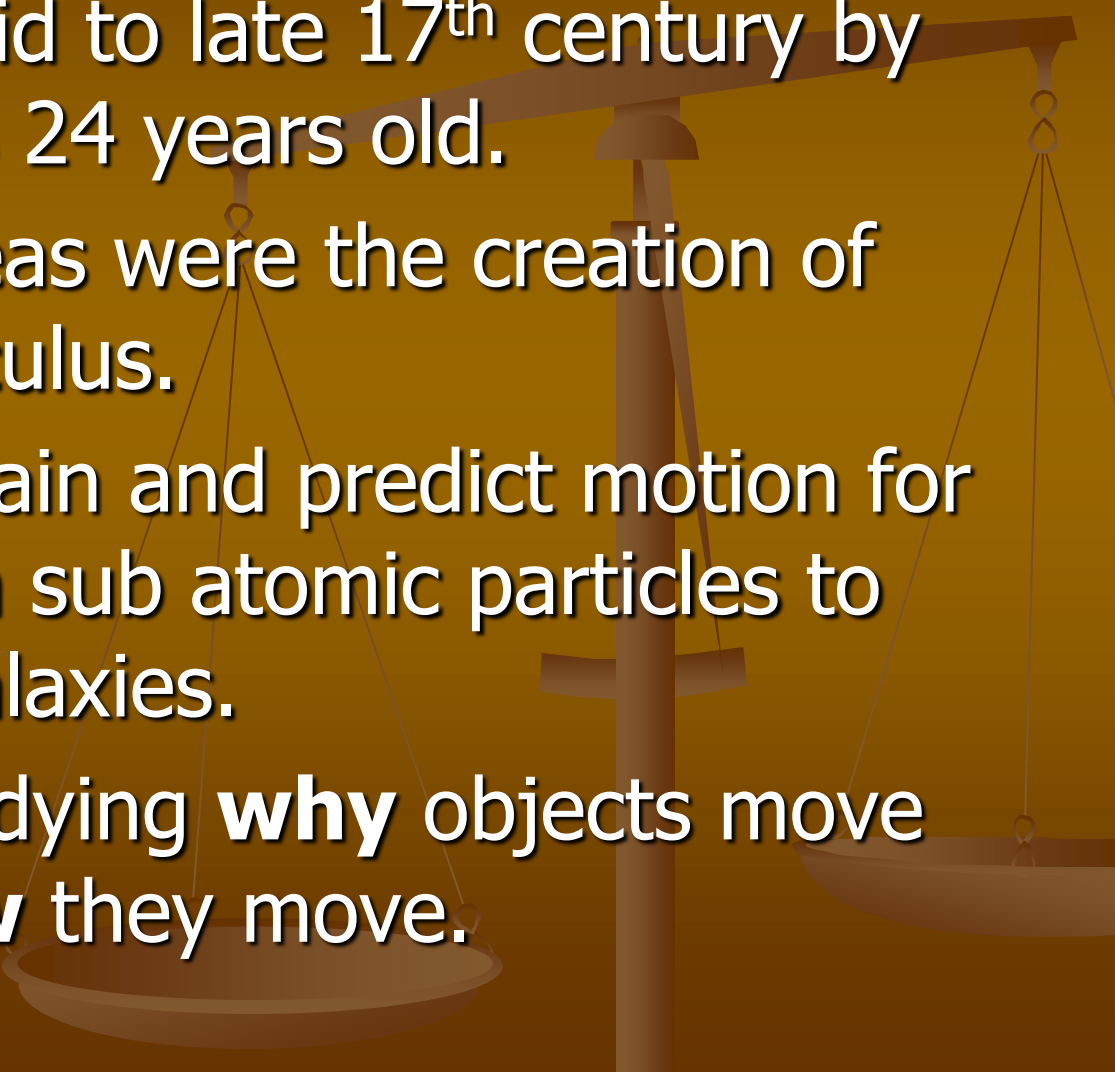
1. Define inertia and describe examples of inertia

Warm Up: What happens when you're crazy school bus driver suddenly slams on the brakes to stop for a student that they almost drove past? Why does this occur?

Assignment: Book Problems p112 #41, 42, 43, 53

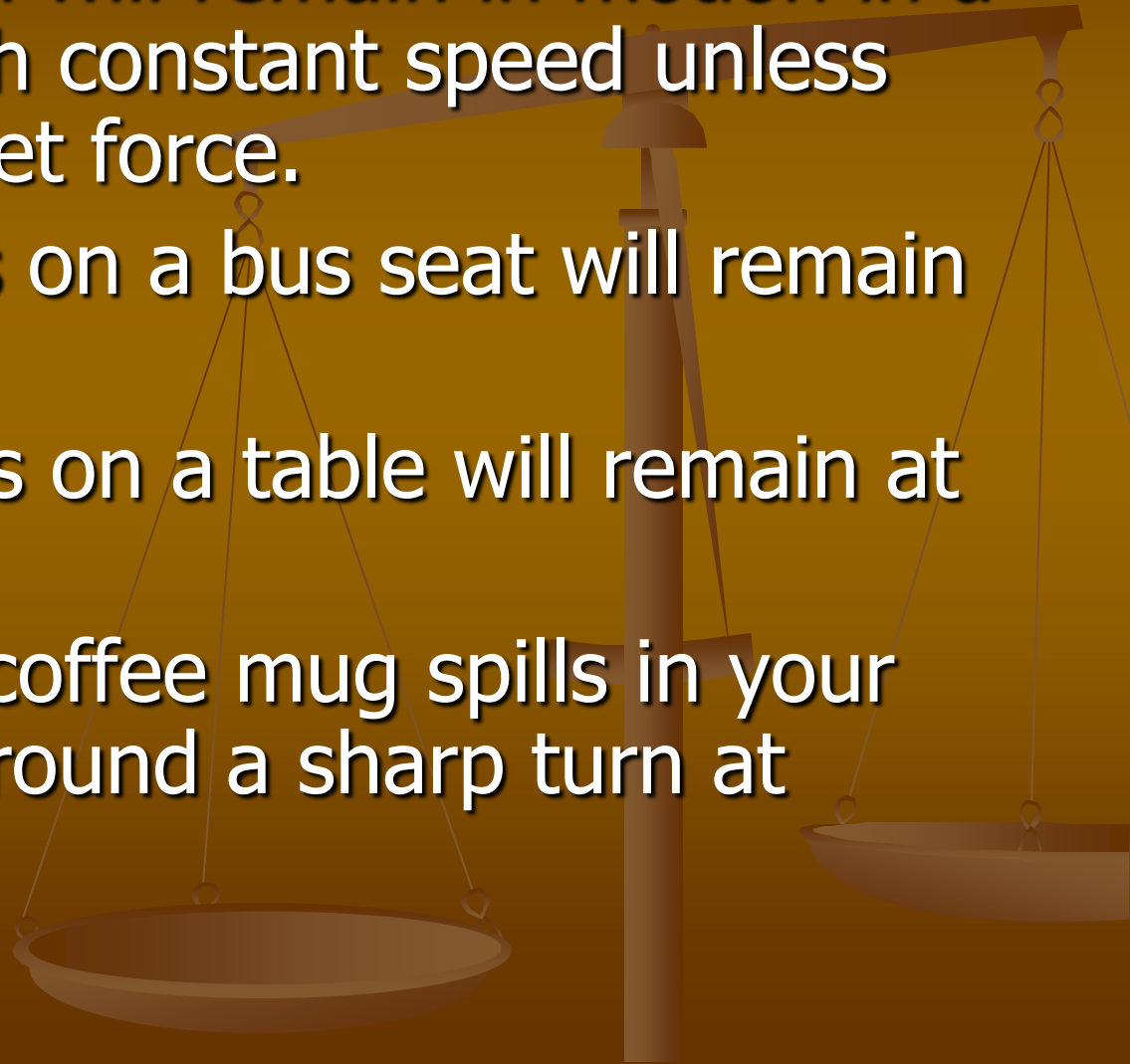


Newton's Laws of Motion

- Isaac Newton developed his laws of motion in the mid to late 17th century by the time he was 24 years old.
 - His laws and ideas were the creation of physics and calculus.
 - These laws explain and predict motion for all objects; from sub atomic particles to the stars and galaxies.
 - We are now studying **why** objects move rather than **how** they move.
- 

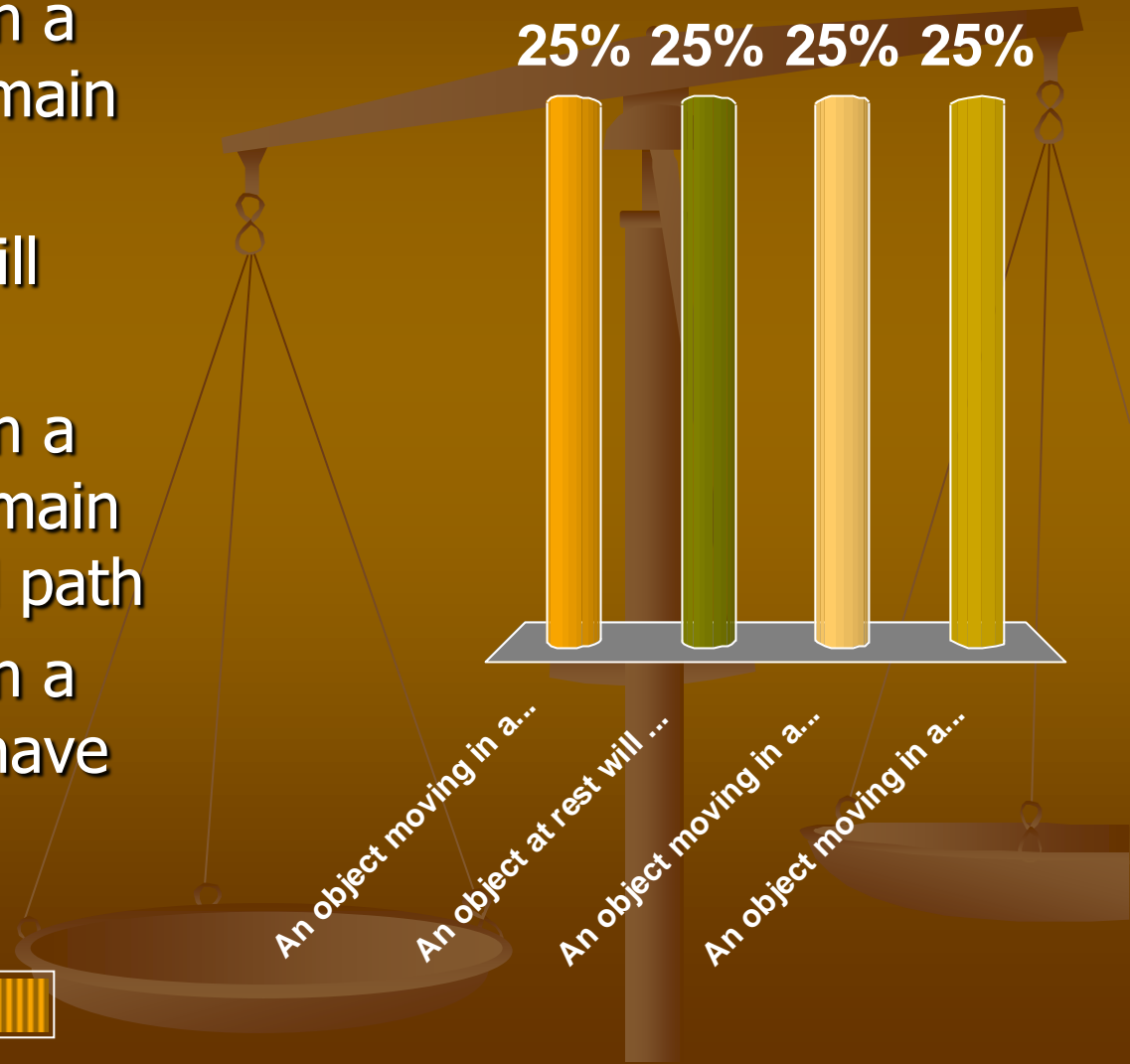
Newton's First Law (Law of Inertia)

- An object at rest will remain at rest and an object in motion will remain in motion in a straight line with constant speed unless acted on by a net force.
- Example: Books on a bus seat will remain in motion.
- Example: Dishes on a table will remain at rest.
- Example: Your coffee mug spills in your car as you go around a sharp turn at constant speed.



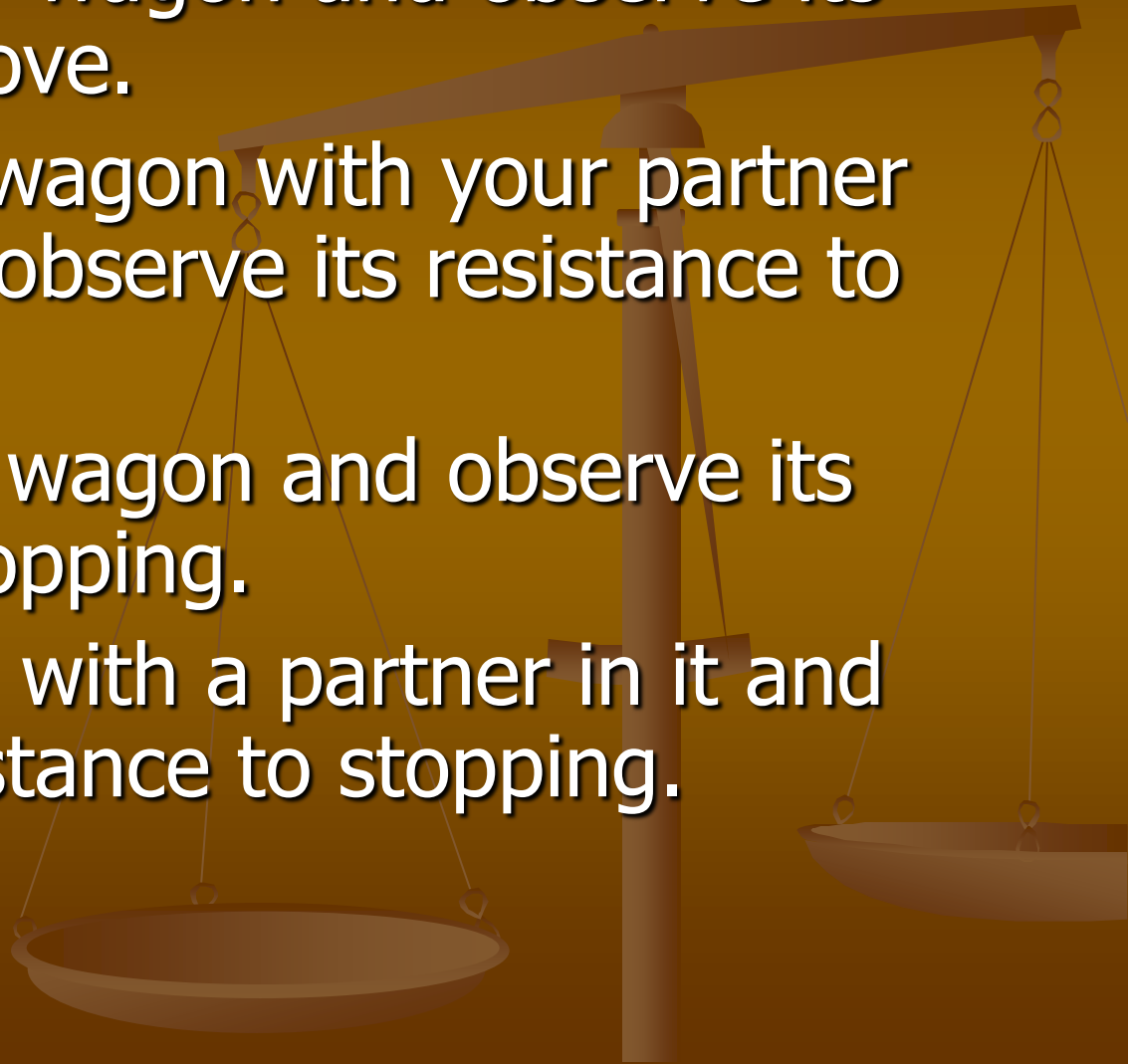
Which of the following is false?

1. An object moving in a straight line will remain in a straight line
2. An object at rest will remain at rest
3. An object moving in a curved path will remain moving in a curved path
4. An object moving in a curved path must have a force acting on it



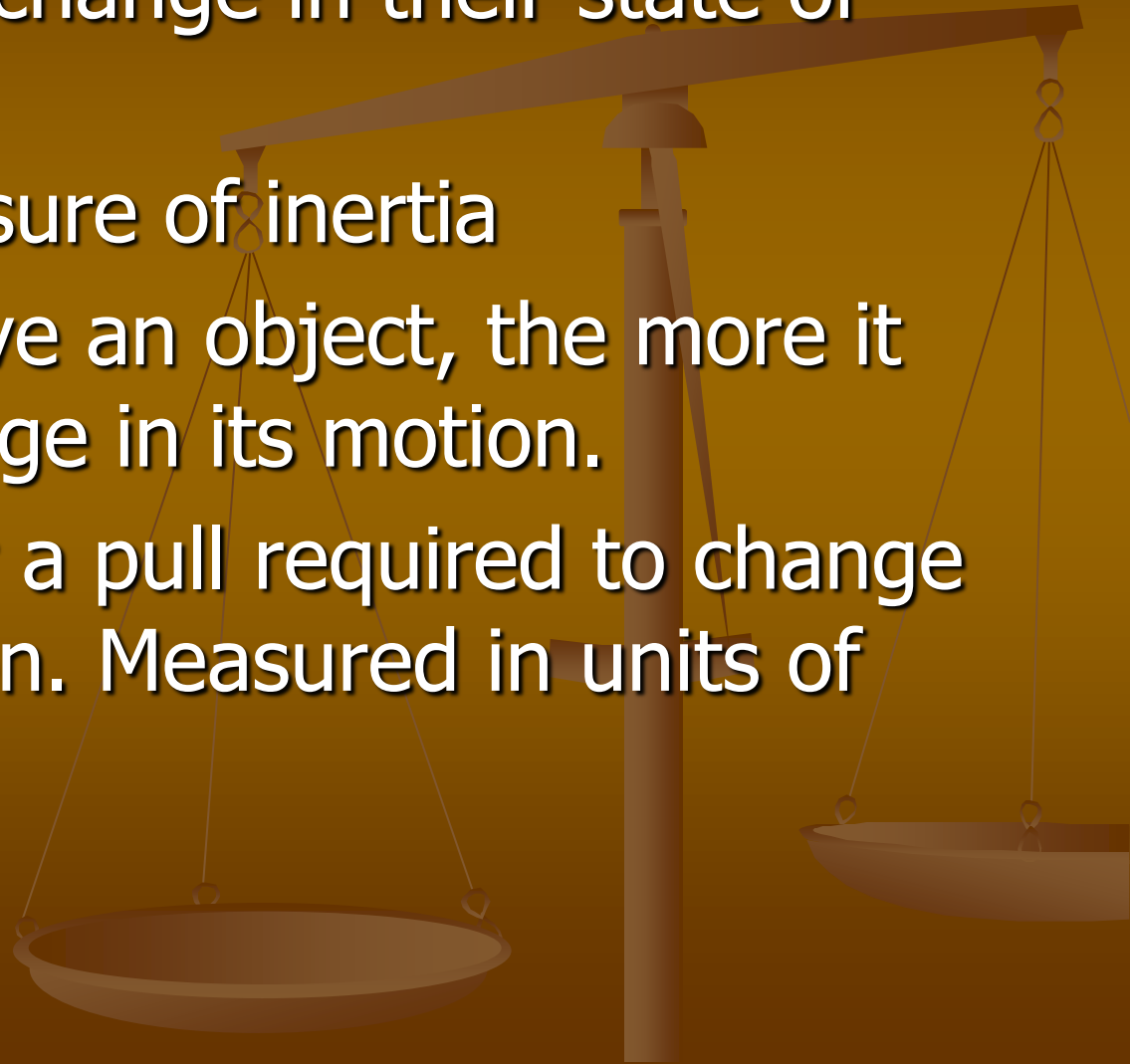
Project

- Push and empty wagon and observe its resistance to move.
- Push the same wagon with your partner sitting in it and observe its resistance to move.
- Stop the empty wagon and observe its resistance to stopping.
- Stop the wagon with a partner in it and observe its resistance to stopping.



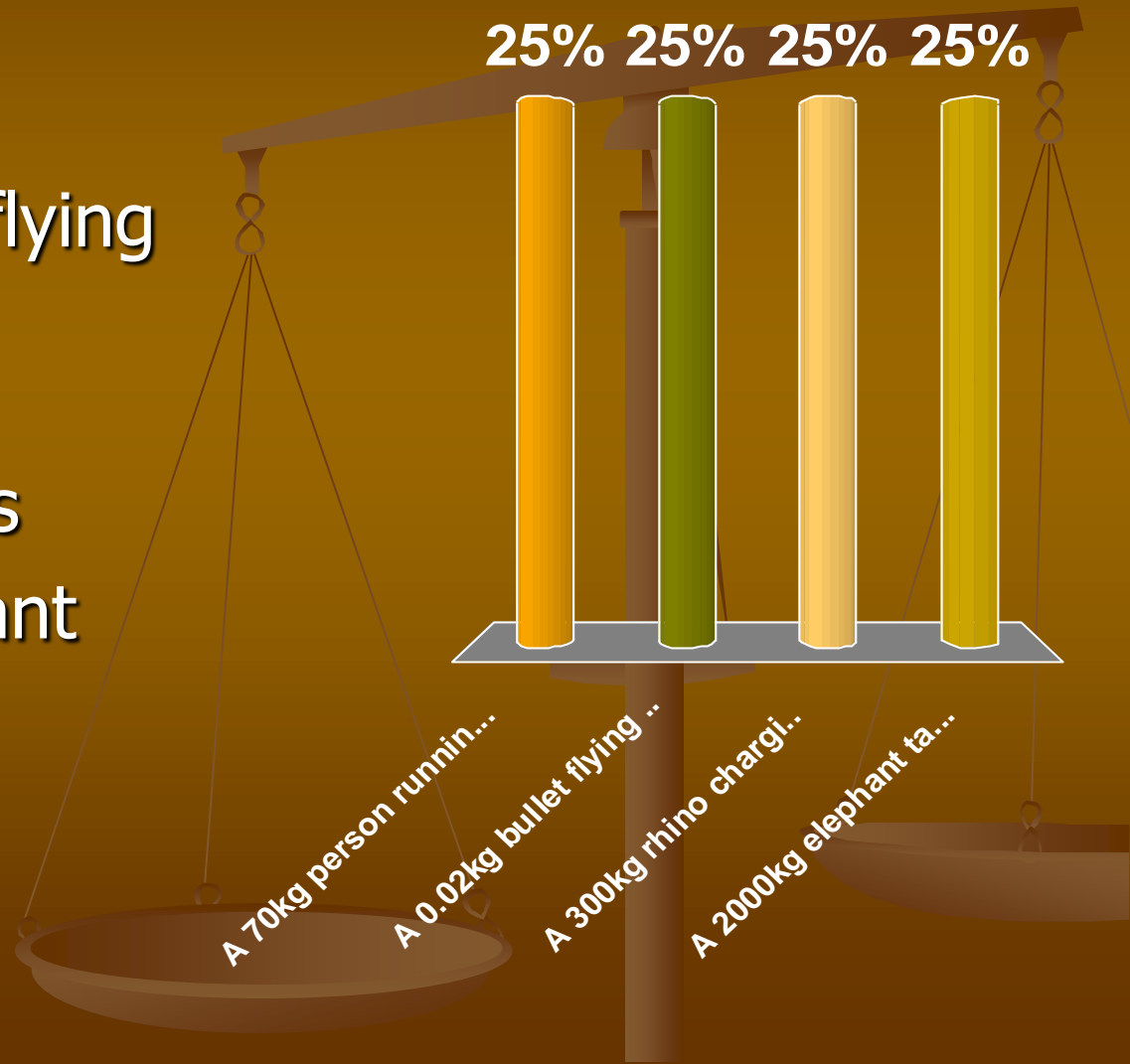
Newton's First Law

- Inertia: The tendency for all objects with mass to resist a change in their state of motion.
- Mass is the measure of inertia
- The more massive an object, the more it will resist a change in its motion.
- Force: A push or a pull required to change an object's motion. Measured in units of Newtons (N).



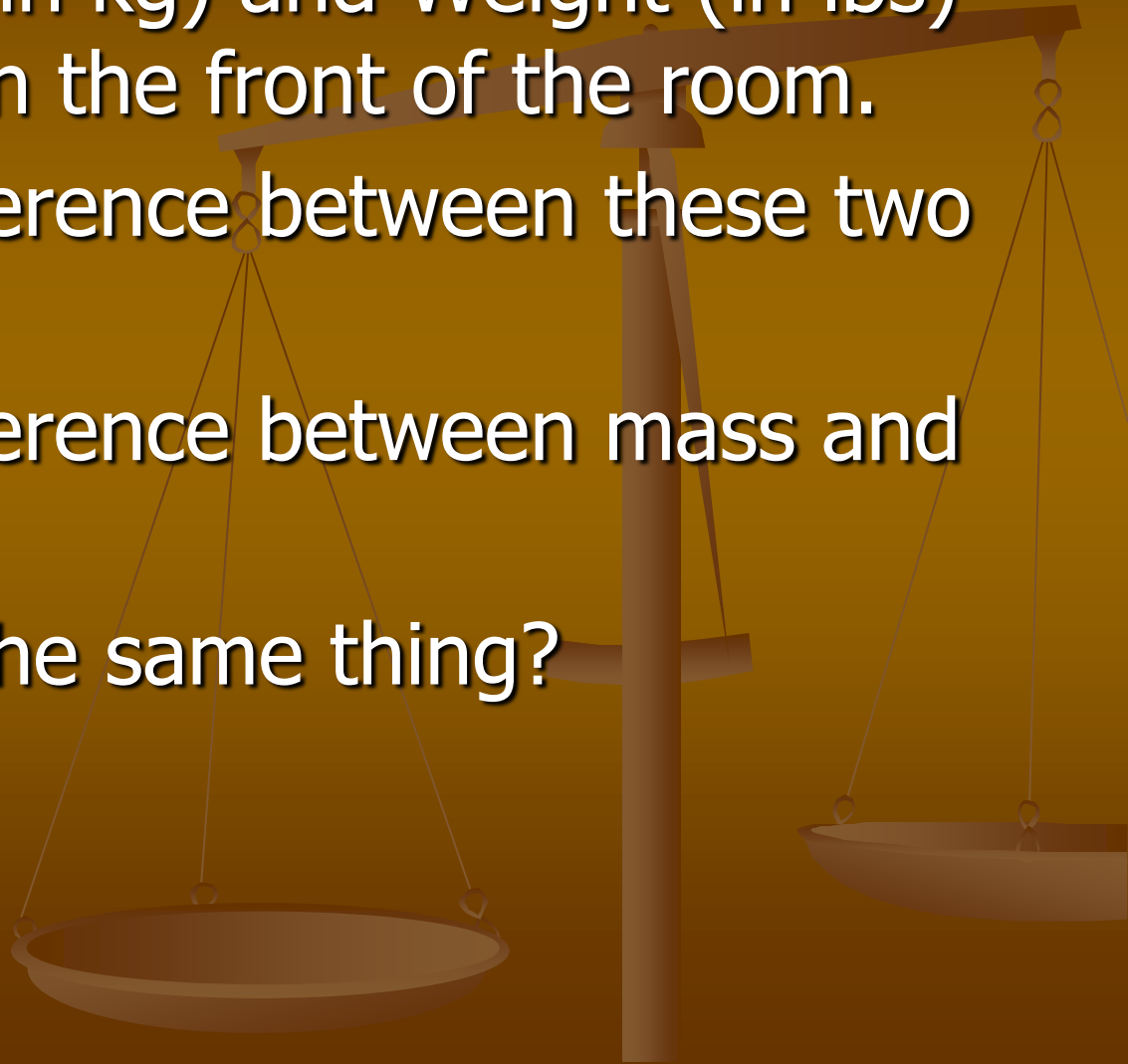
Which of the following has the most inertia?

1. A 70kg person running at 5m/s
2. A 0.02kg bullet flying at 450m/s
3. A 300kg rhino charging at 3m/s
4. A 2000kg elephant taking a nap



Project

- Get your Mass (in kg) and Weight (in lbs) from the scale in the front of the room.
- What is the difference between these two numbers?
- What is the difference between mass and weight?
- Do they mean the same thing?



Lesson #24

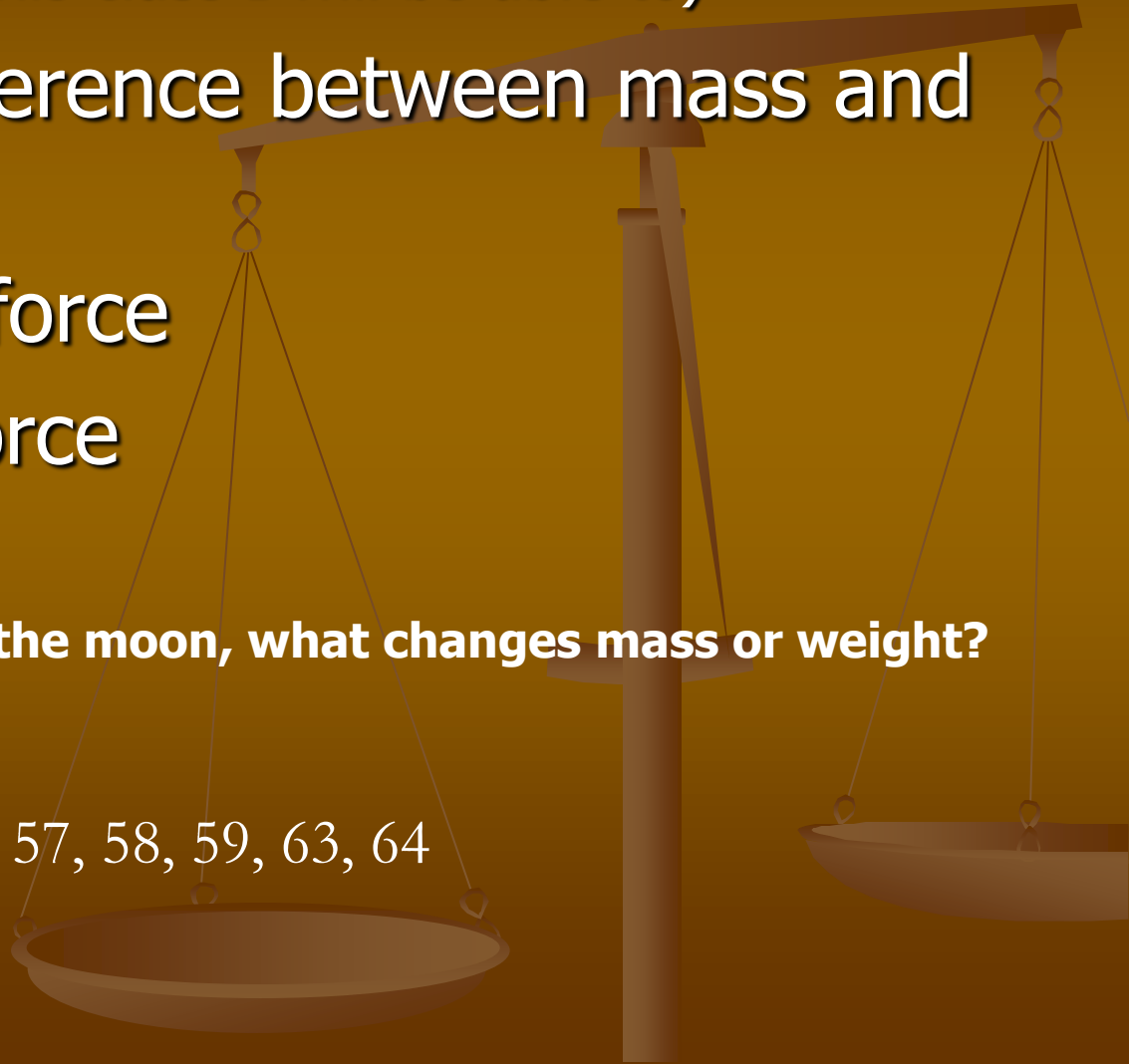
Topic: Mass vs. Weight

Objectives: (After this class I will be able to)

1. Explain the difference between mass and weight
2. Define normal force
3. Describe Net force

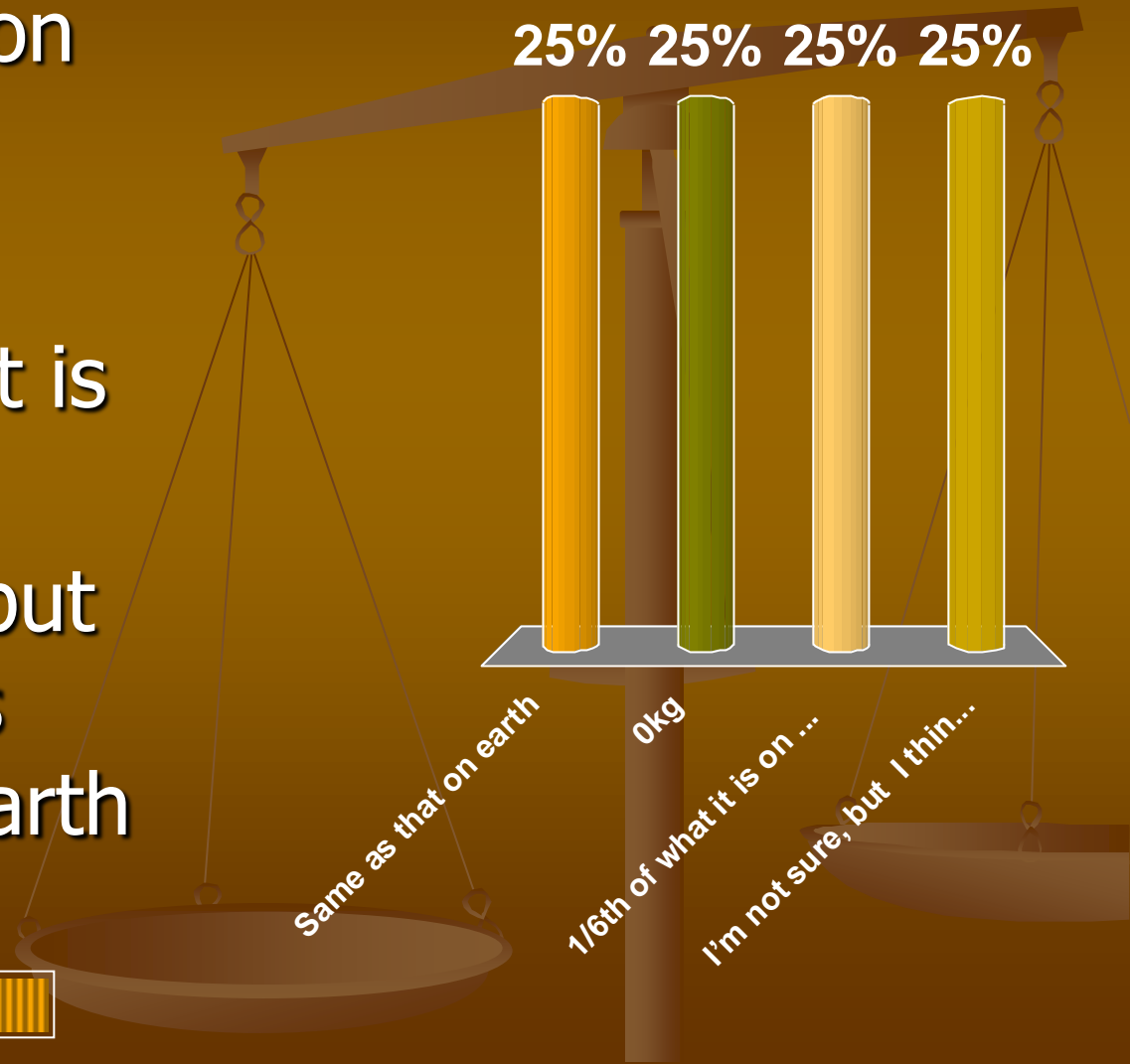
Warm Up: When you go to the moon, what changes mass or weight?
Why?

Assignment: p 113 #55, 57, 58, 59, 63, 64



What is your **mass** on the moon?

1. Same as that on earth
2. 0kg
3. $\frac{1}{6}^{\text{th}}$ of what it is on earth
4. I'm not sure, but I think it's less than it is on earth



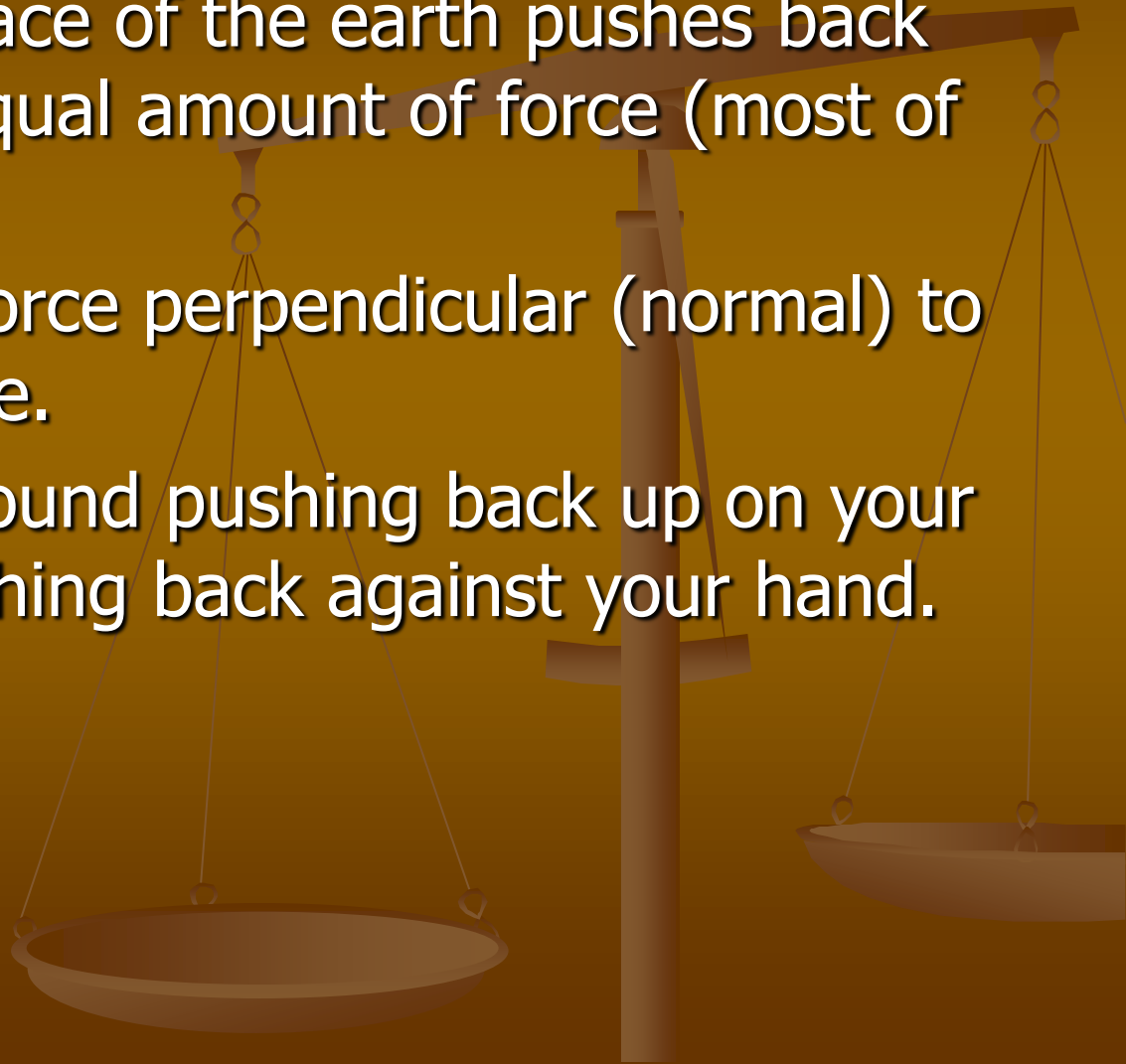
Mass vs. Weight

- The mass of an object remains constant (no matter the location)
- The weight of an object depends upon gravity.
- Example: A person's mass is the same on earth as it is on the moon. A person's weight on the moon is 1/6th of what it is on earth.
- **Weight** is a **force** due to a gravitational pull.
- The weight of an object on Earth :

$$F_w = mg$$

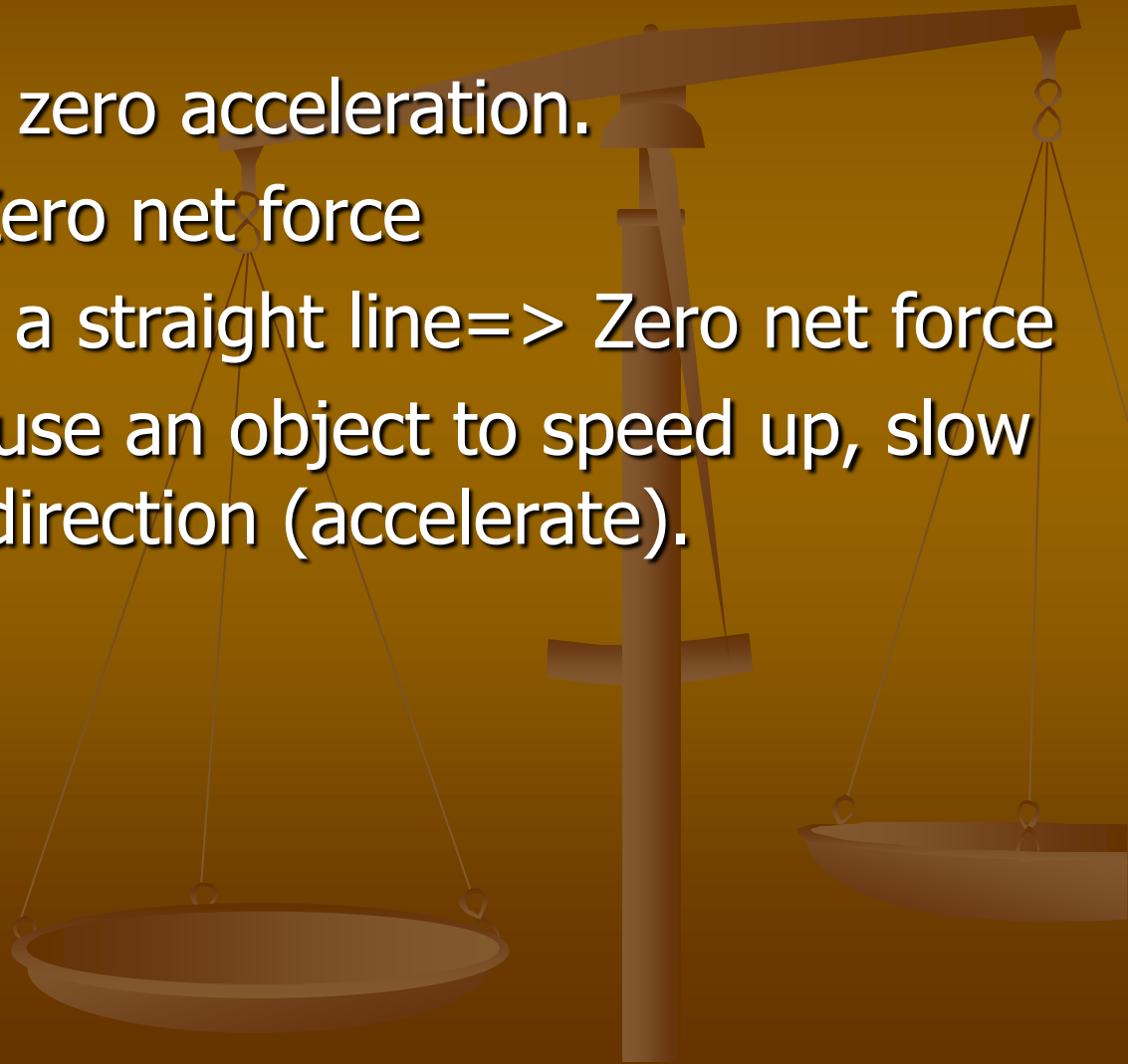
Weight and Normal Force

- Force of **weight** acts downward on all objects.
- However, the surface of the earth pushes back upward with an equal amount of force (most of the time).
- Normal Force: A force perpendicular (normal) to the contact surface.
- Examples: The ground pushing back up on your feet. The wall pushing back against your hand.



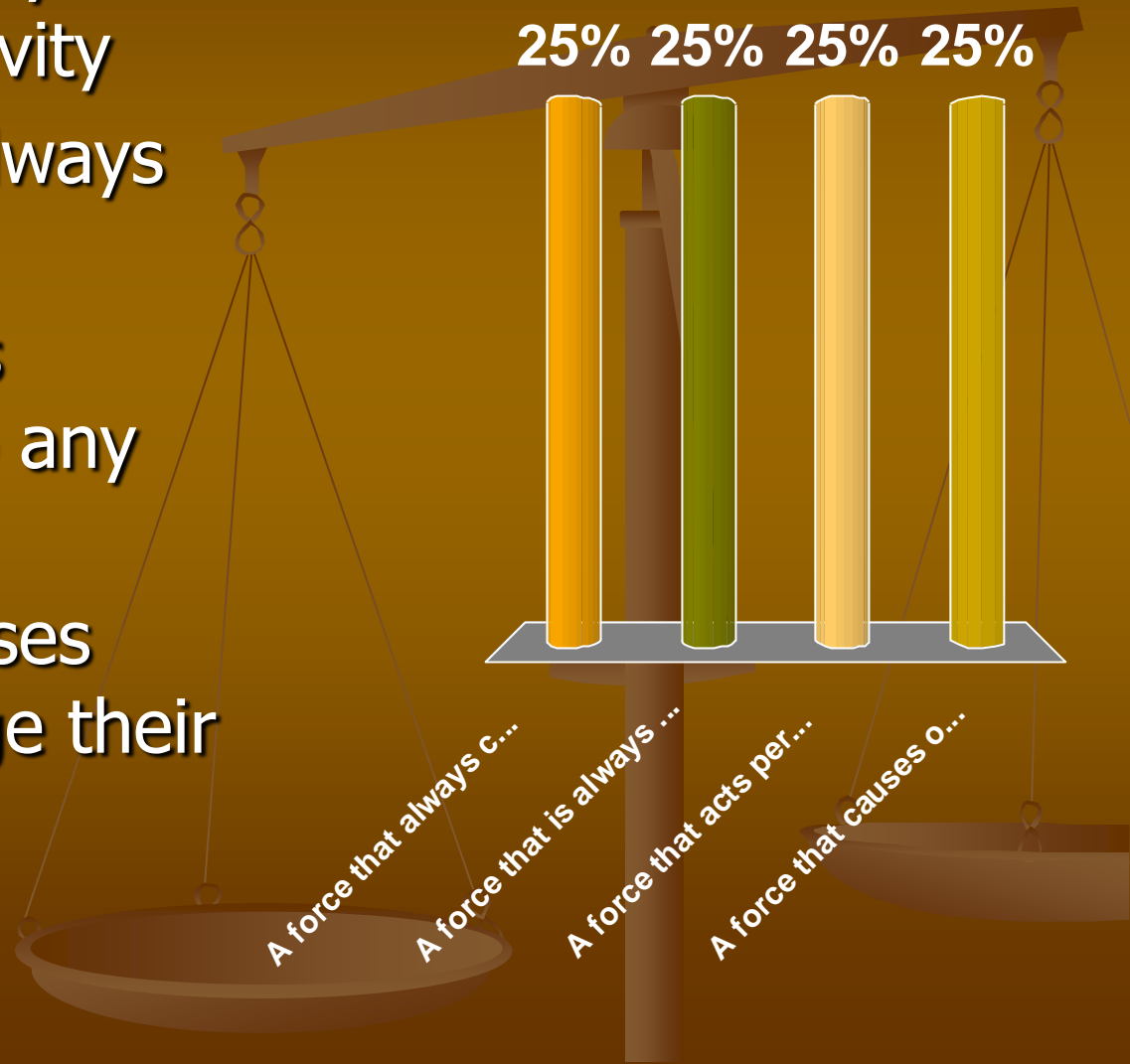
Net Force

- Net Force: The vector sum of all forces acting on an object.
- Zero net force \Rightarrow zero acceleration.
- State of rest \Rightarrow Zero net force
- Constant speed in a straight line \Rightarrow Zero net force
- A net force will cause an object to speed up, slow down, or change direction (accelerate).



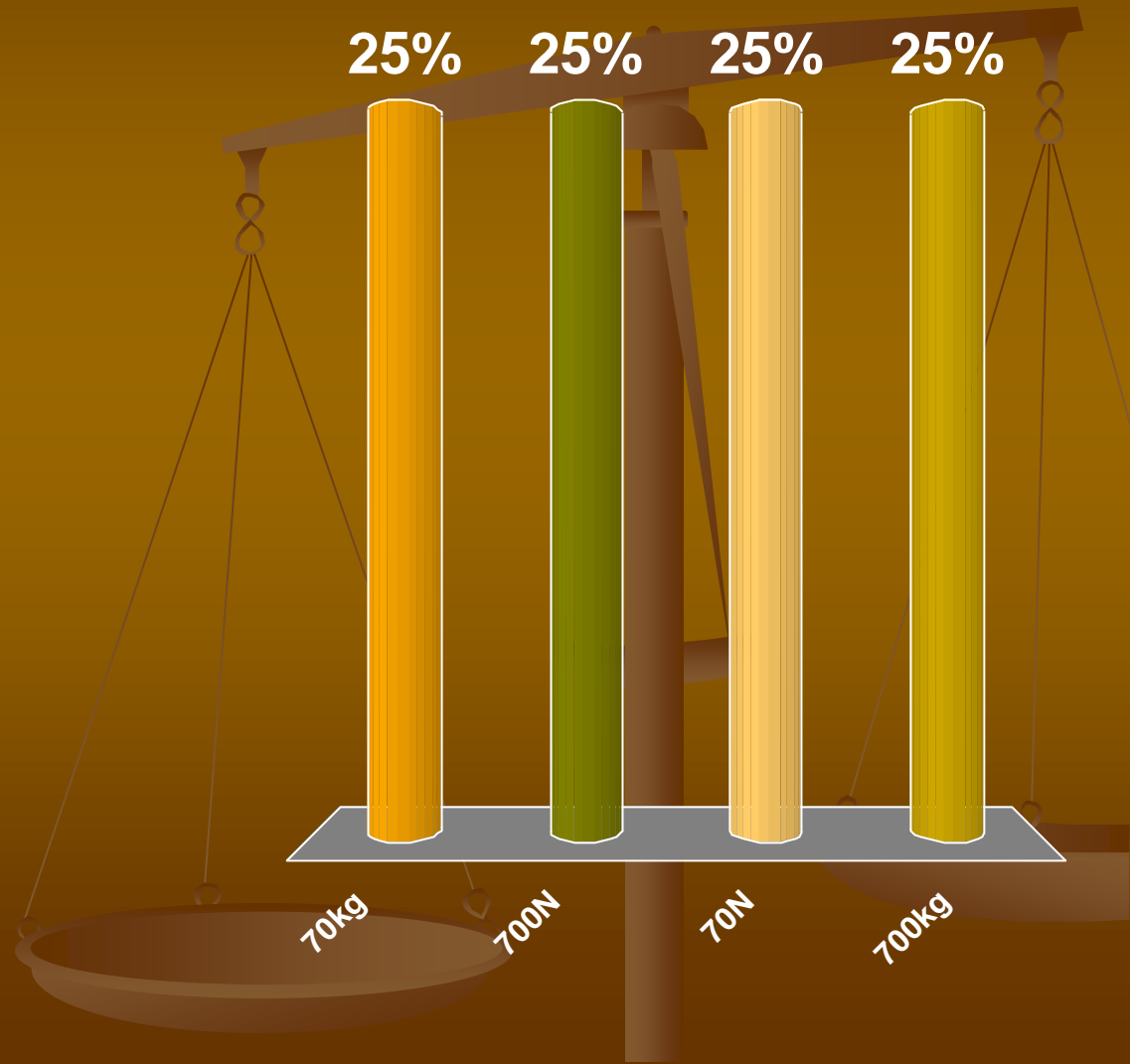
Normal force is...

1. A force that always counter acts gravity
2. A force that is always directed upward
3. A force that acts perpendicular to any contact surface
4. A force that causes objects to change their state of motion



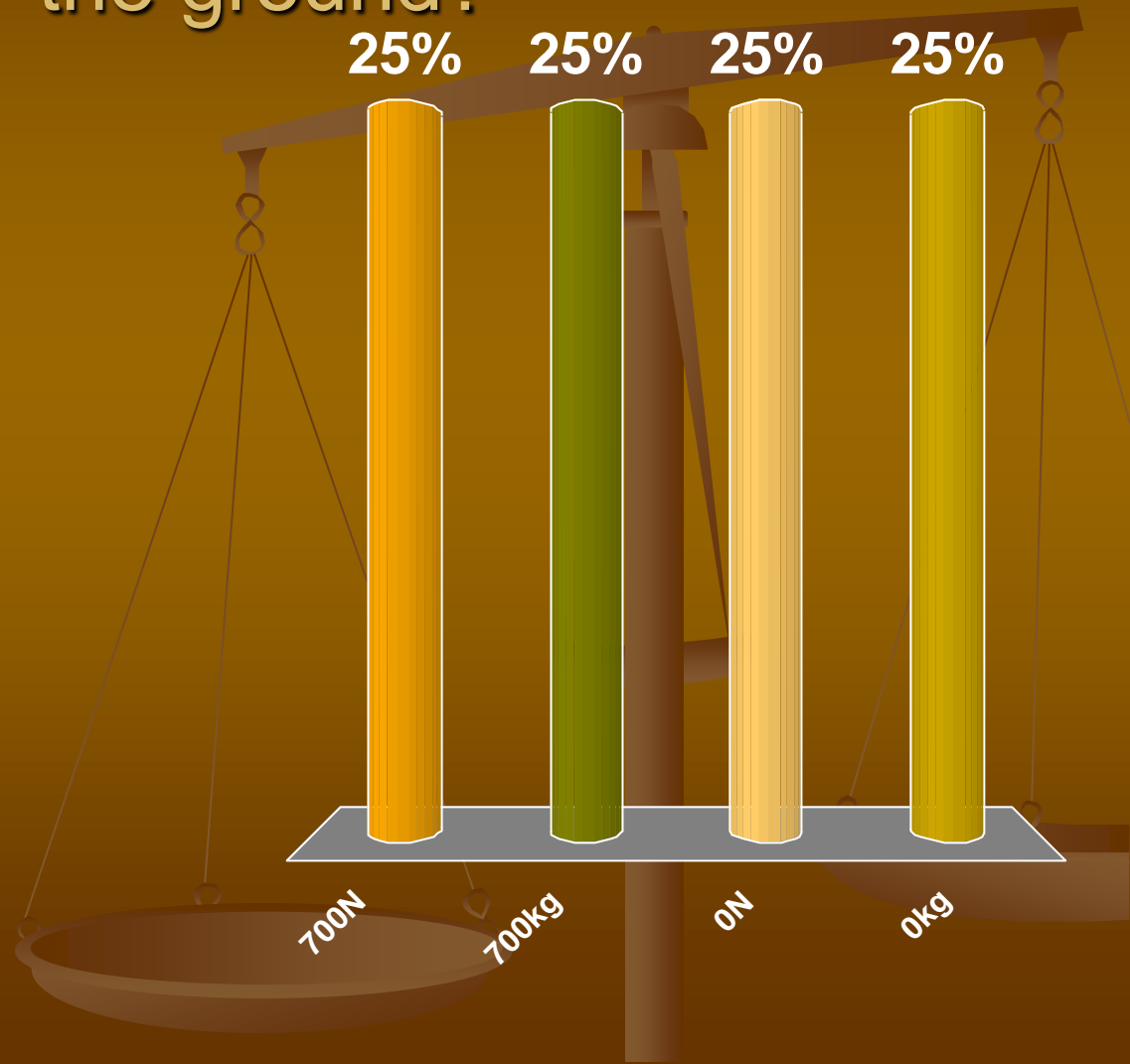
What is the weight of a person with a mass of 70kg?

1. 70kg
2. 700N
3. 70N
4. 700kg



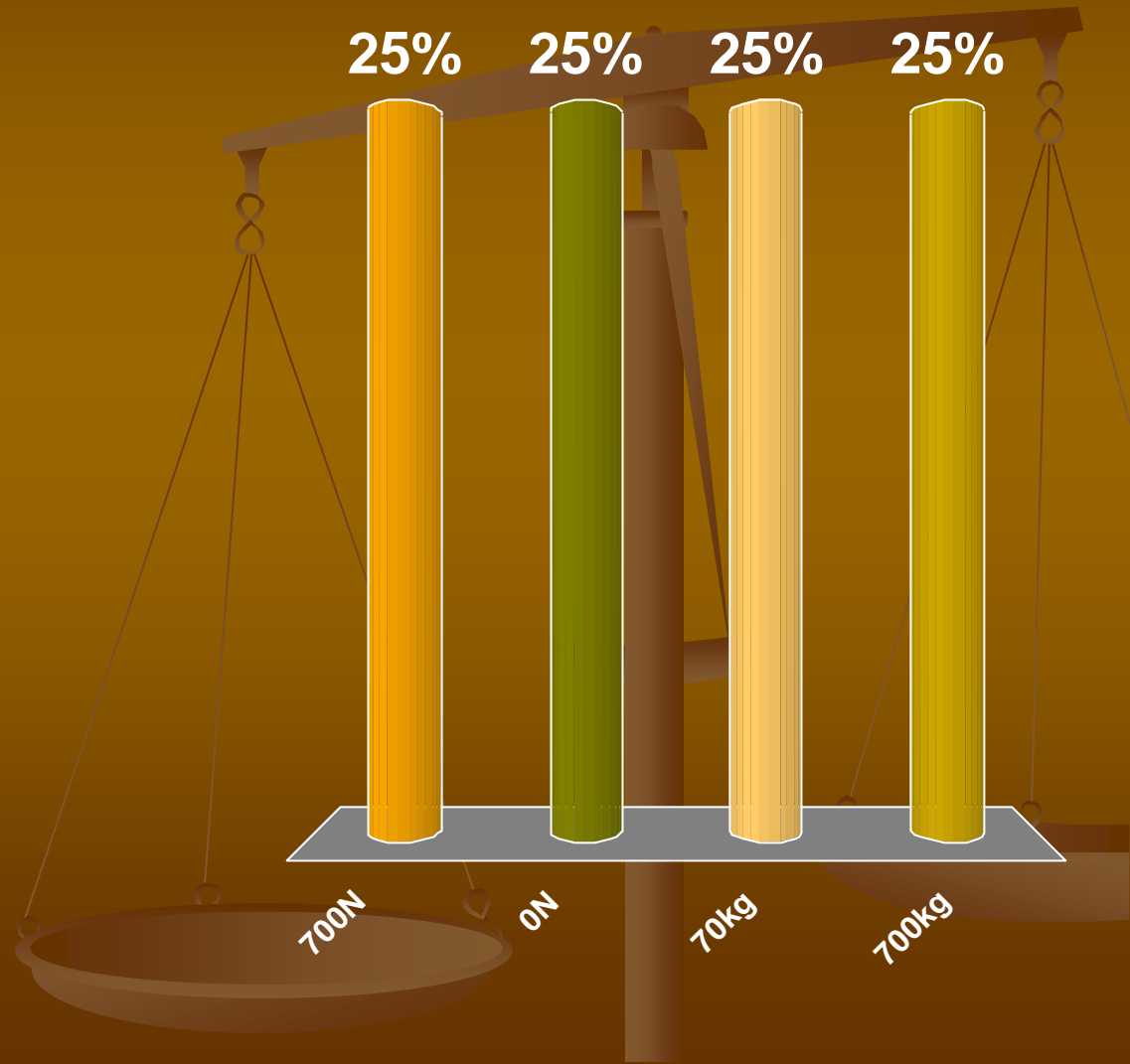
What is the net force acting on a person that has a mass of 70kg when standing on the ground?

1. 700N
2. 700kg
3. 0N
4. 0kg



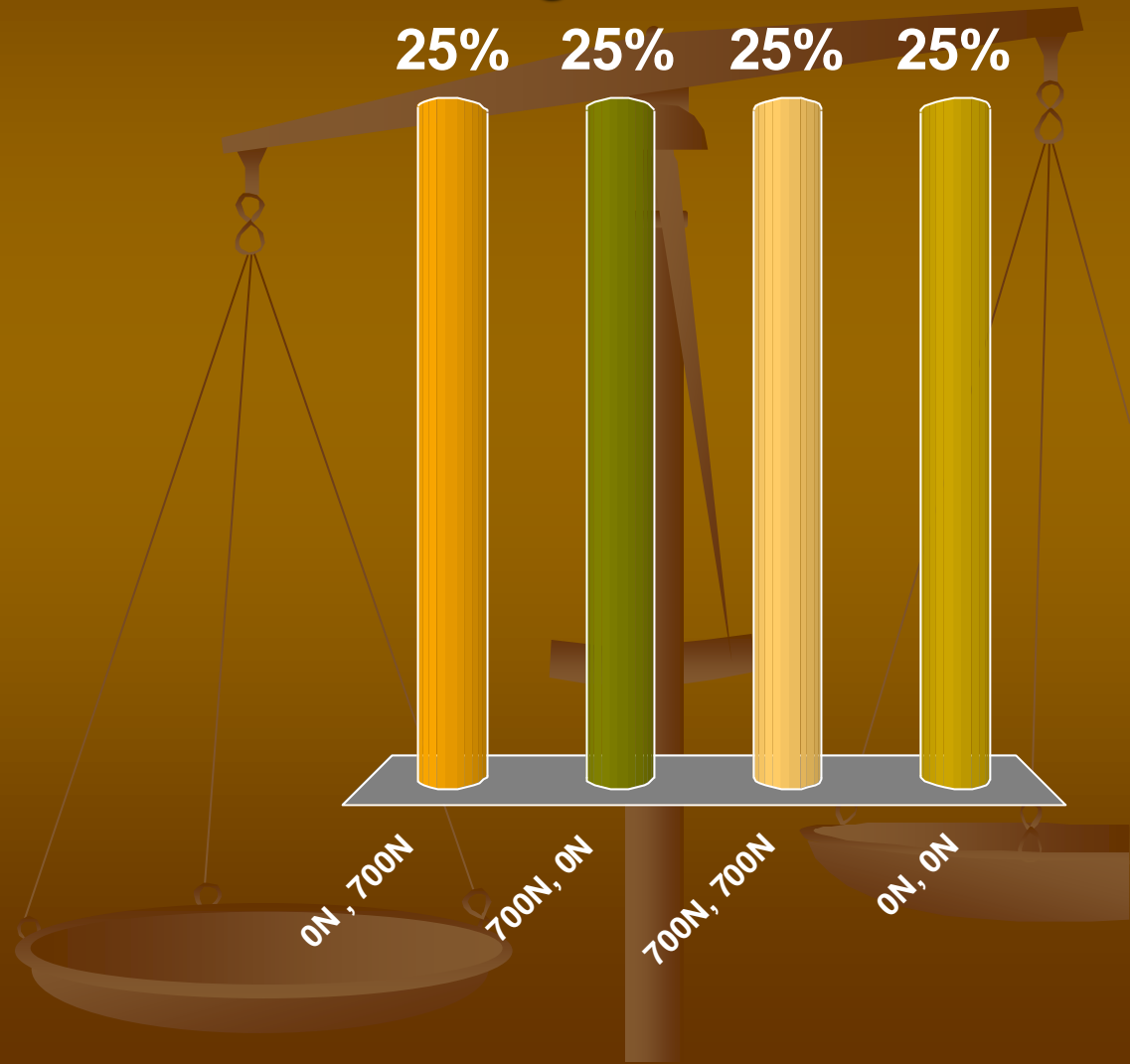
What is the normal force acting on a 70kg person when standing on the ground?

1. 700N
2. 0N
3. 70kg
4. 700kg



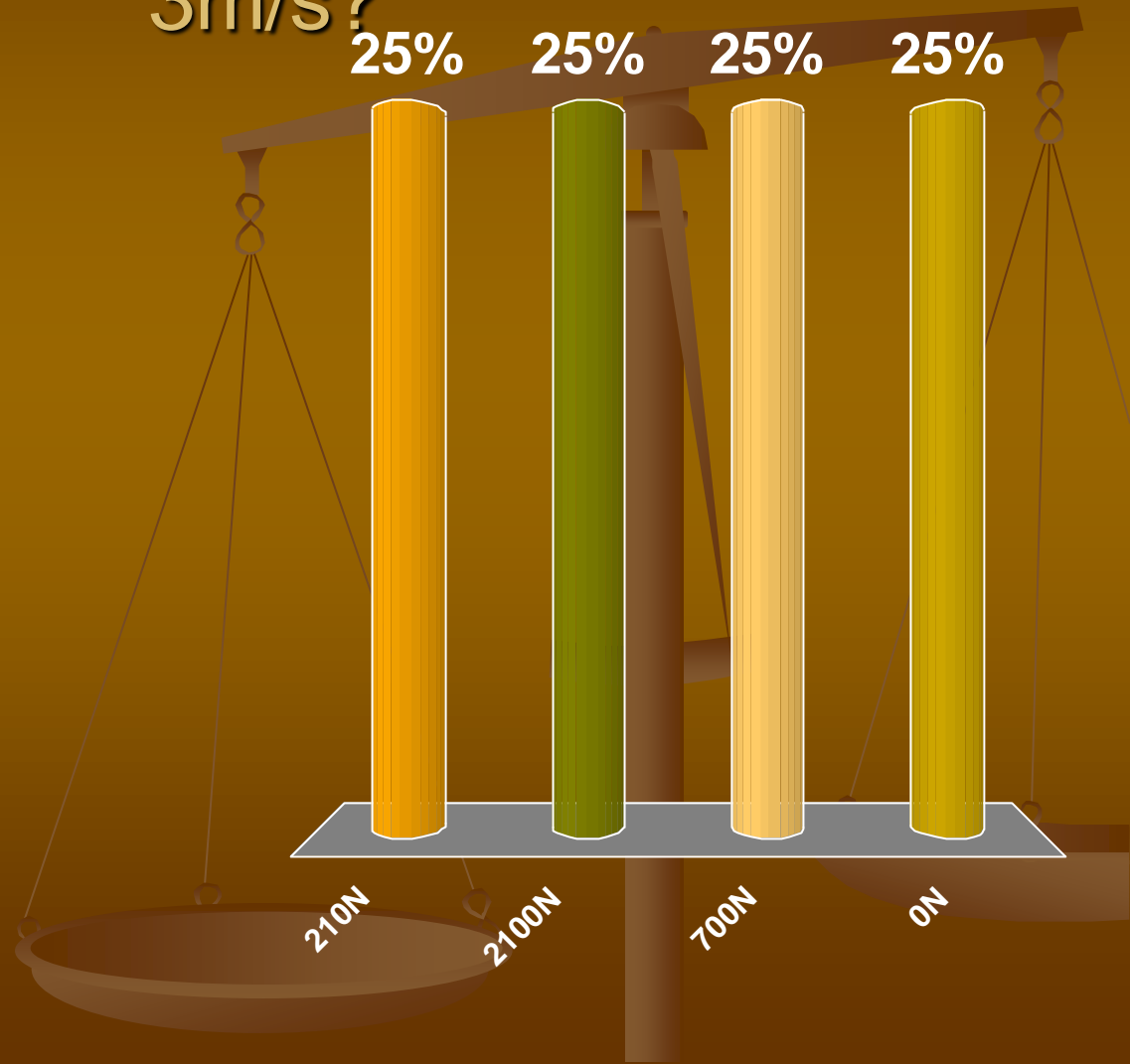
What is the normal force acting on a 70kg person in free fall after jumping out of an airplane?
What is the net force acting on him?

1. 0N , 700N
2. 700N, 0N
3. 700N, 700N
4. 0N, 0N



What is the net force acting on a 70kg person jogging at a constant speed of 3m/s?

1. 210N
2. 2100N
3. 700N
4. 0N



Telephone Pole

- You are working for the telephone company putting up new poles. The pole you are putting up now has one wire headed 20° W of N with 2200N of tension. It has another wire headed directly south with 2400N of tension. Your job is to determine much tension and in what direction should a support wire to the ground be placed so that there is no net force acting on the pole.



Lesson #25

11/1/06

Topic: Net Force and Free body diagrams

Objectives: (After this class I will be able to)

1. Draw a free body vector diagram
2. Use vector addition rules to find the magnitude and direction net force.

Warm Up: What is the weight of a 1kg wood block? What is its mass?

Assignment: "Net Force" handout due tomorrow

What is the weight of a 1kg wood block? What is its mass?

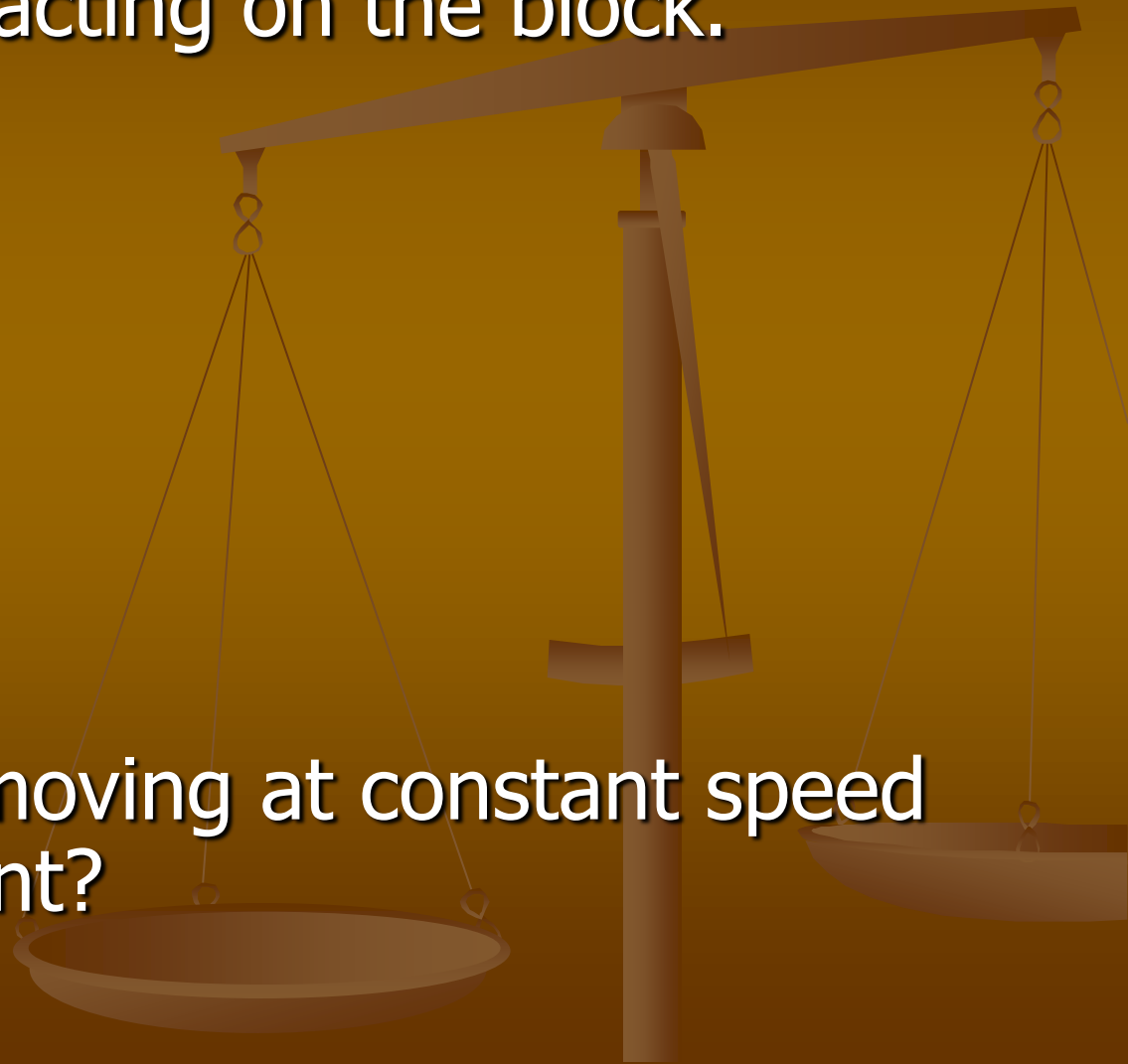
1. 1N, 1kg
2. 10N, 1kg
3. 1kg, 10N
4. 1kg, 1N



Free Body Diagrams

- Draw a wood block sitting on a table.
- Draw all forces acting on the block.
- $F_{\text{net}} = ?$

- Would a block moving at constant speed look any different?



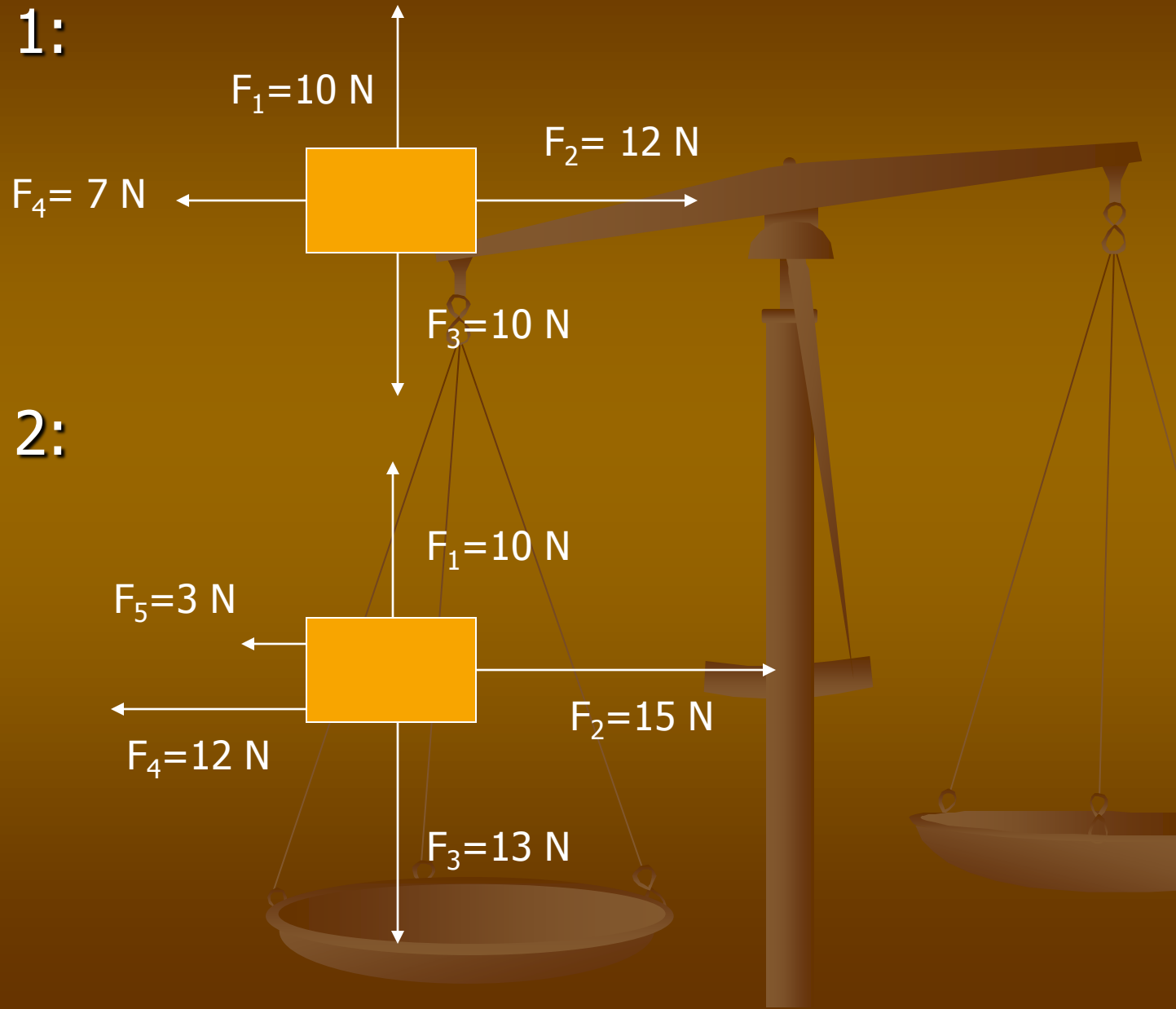
Free Body Diagrams

- Example 1:

- $F_{\text{net}} = ?$

- Example 2:

- $F_{\text{net}} = ?$



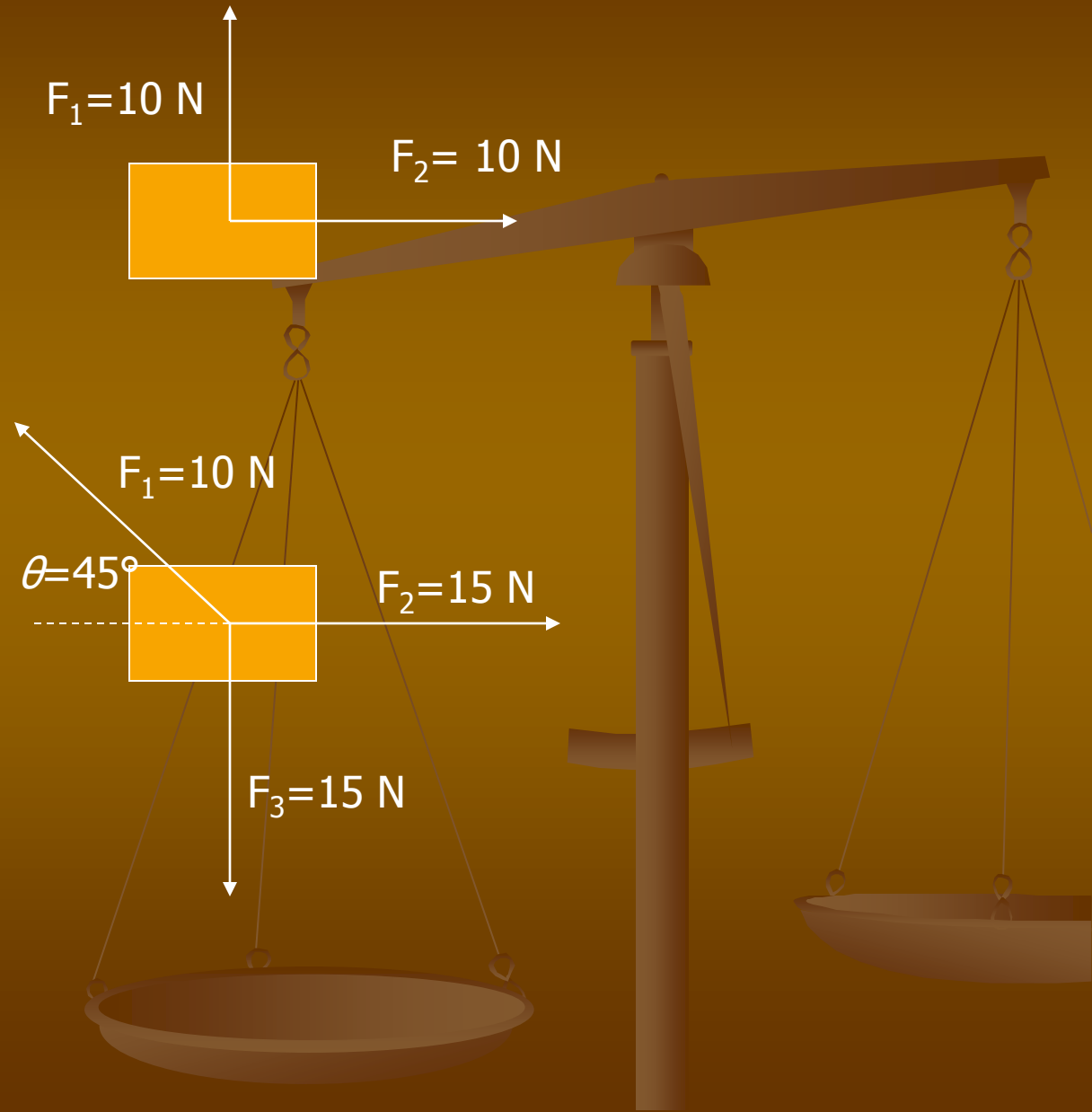
Free Body Diagrams

■ Example 3:

■ $F_{\text{net}} = ?$

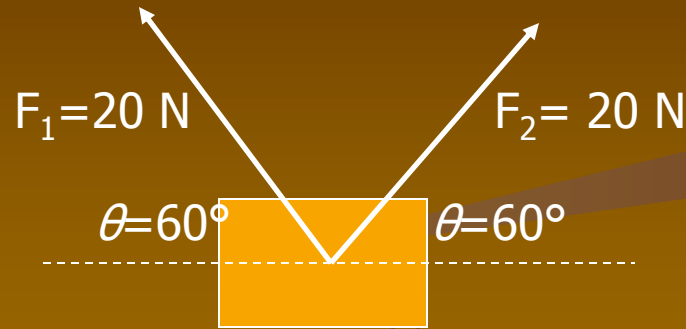
■ Example 4:

■ $F_{\text{net}} = ?$



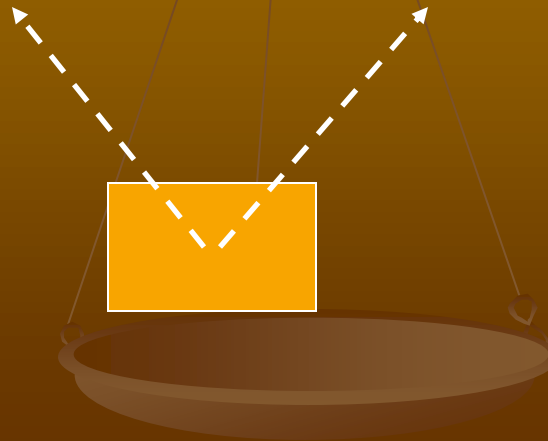
Free Body Diagrams

■ Example 5:



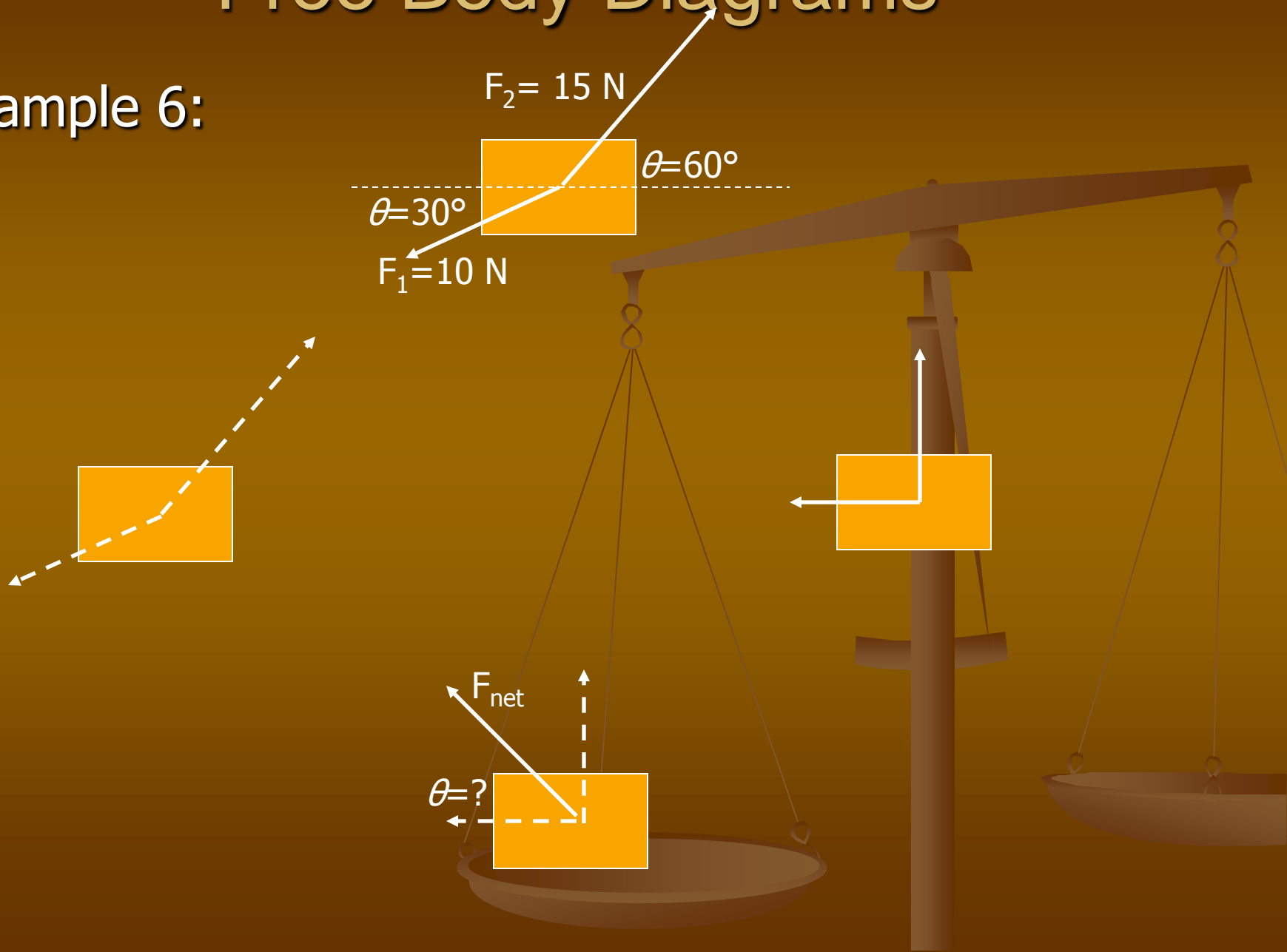
Split F_1 and F_2 into x and y components

Sum x components and y components



Free Body Diagrams

■ Example 6:



Lesson #26

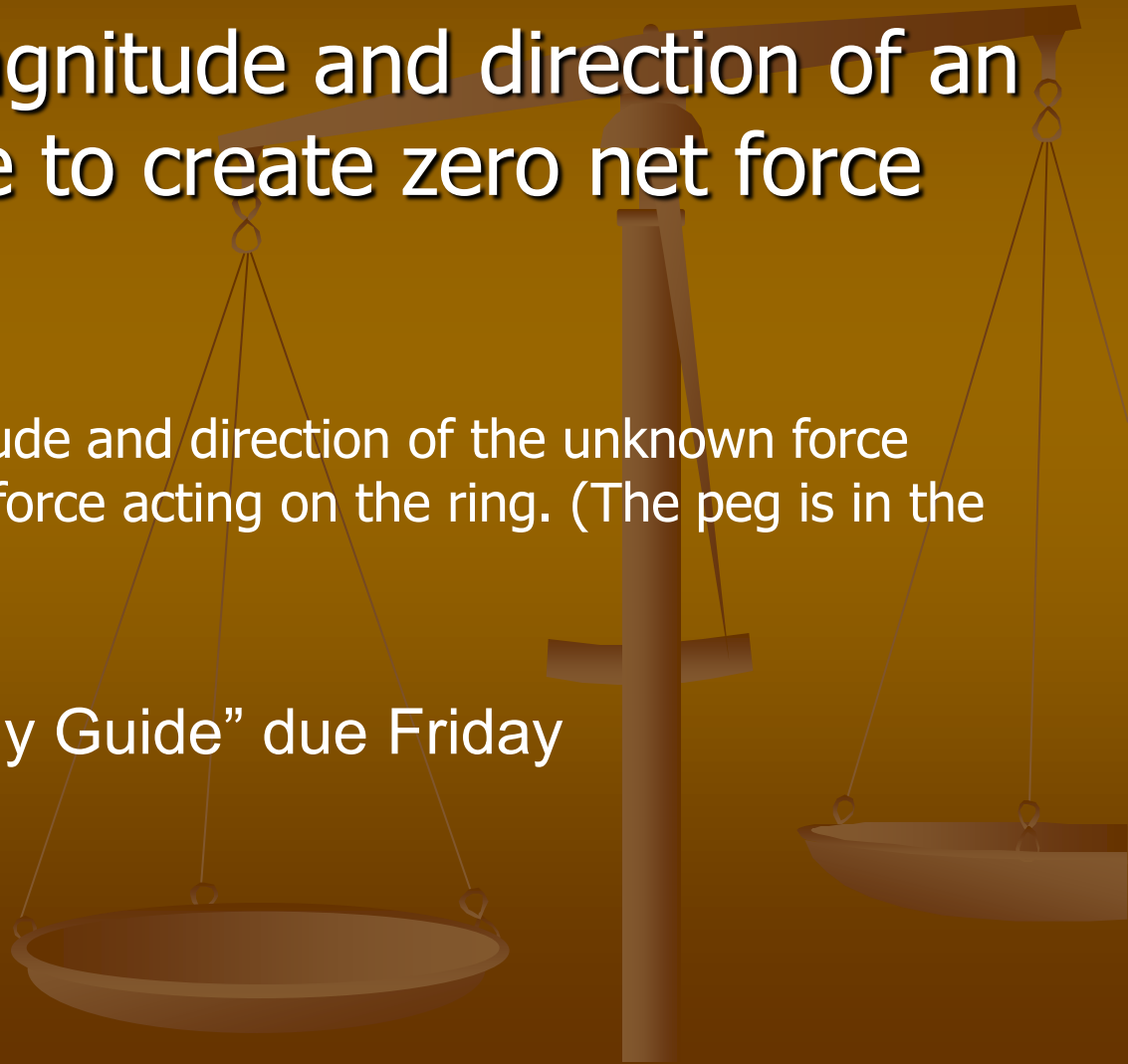
Topic: Lab: Net force and angles

Objectives: (After this class I will be able to)

1. Predict the magnitude and direction of an unknown force to create zero net force

Lab Task: Predict the magnitude and direction of the unknown force such that there will be no net force acting on the ring. (The peg is in the center of the ring)

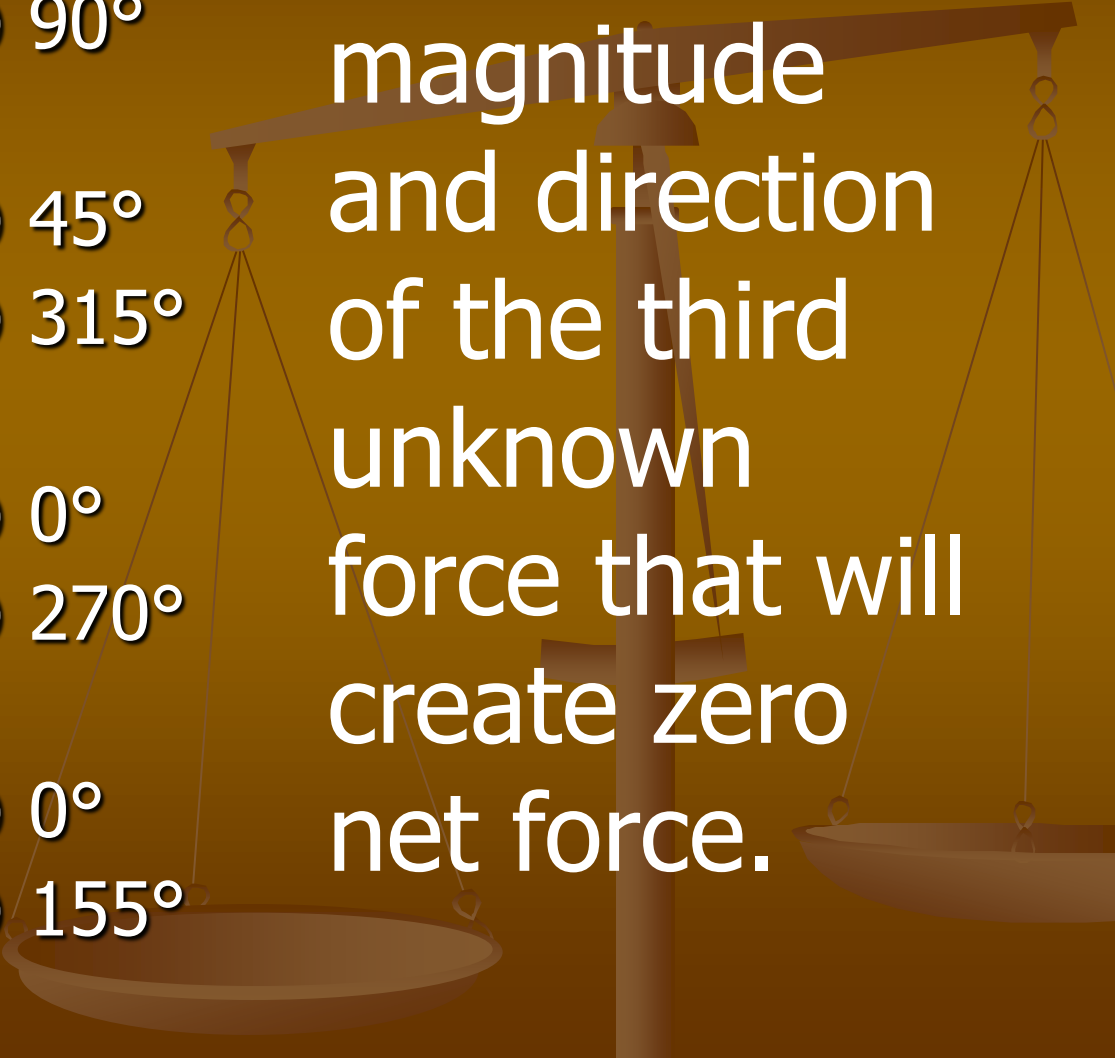
Assignment: "Ch 4 Study Guide" due Friday



1 washer = 0.5 Newtons

- Task 1
 - 3N @ 0°
 - 4N @ 90°
- Task 2
 - 3N @ 45°
 - 3N @ 315°
- Task 3
 - 5N @ 0°
 - 3N @ 270°
- Task 4
 - 6N @ 0°
 - 2N @ 155°

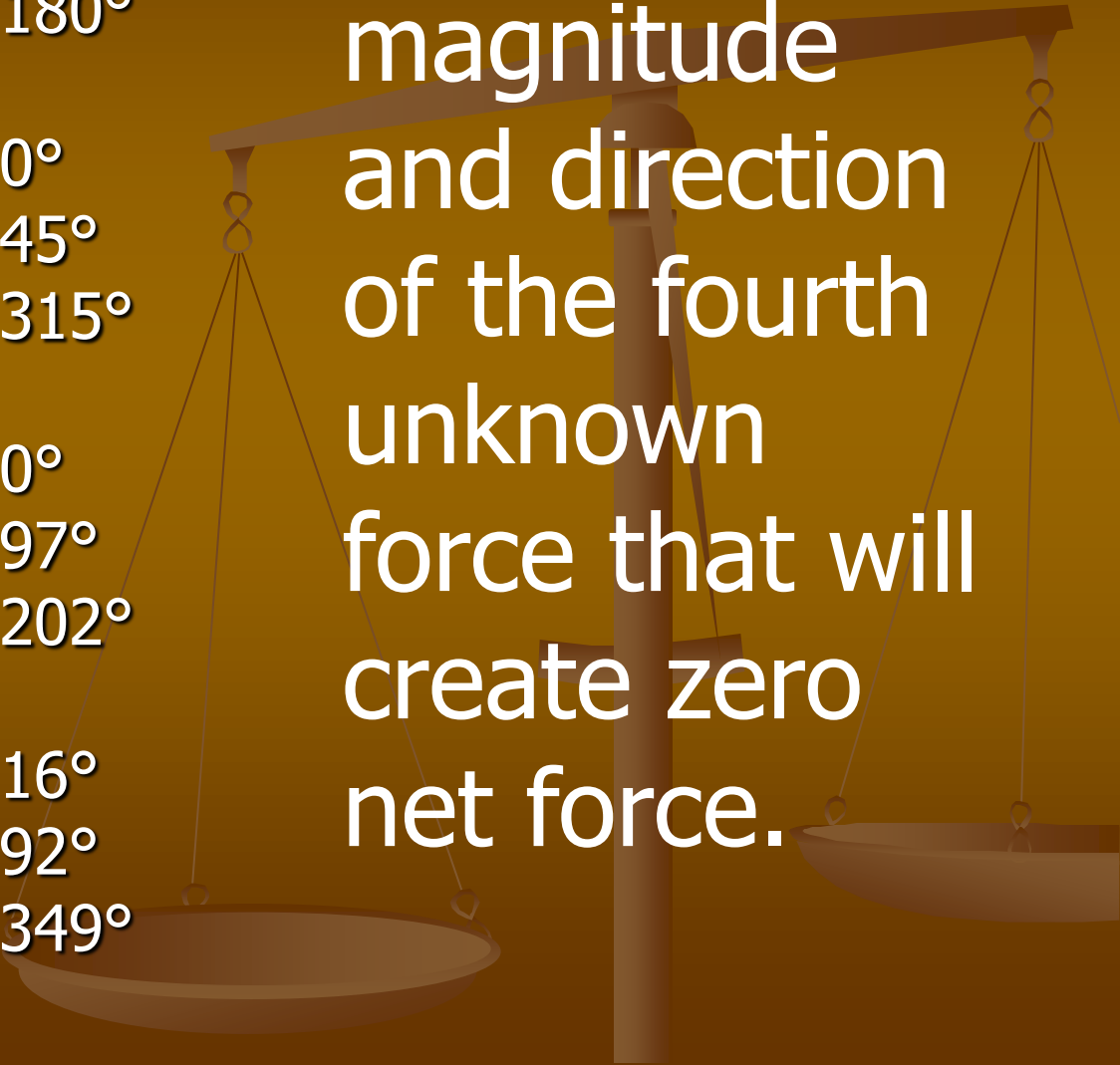
Find the magnitude and direction of the third unknown force that will create zero net force.



1 washer = 0.5 Newtons

- Task 5
 - 1N @ 0°
 - 1N @ 90°
 - 2N @ 180°
- Task 6
 - 3N @ 0°
 - 3N @ 45°
 - 3N @ 315°
- Task 7
 - 2N @ 0°
 - 4N @ 97°
 - 6N @ 202°
- Task 8
 - 5N @ 16°
 - 3N @ 92°
 - 2N @ 349°

Find the magnitude and direction of the fourth unknown force that will create zero net force.



Telephone Pole

- Draw your telephone pole from an aerial view and all of the forces acting on the pole.
- Show all your work in calculating where to put the support wire.
- Write how you explained your solution to your boss when he questioned your decision on where to put the wire.

